

# Designing a Lower Salt Future

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2023 Iowa Transportation Conference



**BOLTON  
& MENK**

Real People. Real Solutions.

# Chloride Problems

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## Forever Pollutant

- EPA standard for aquatic life **230 mg/L**
- Drinking water standard **250 mg/L**
- Damages infrastructure, soil, water, vegetation, and wildlife



# Chloride in Iowa Lakes & Rivers

Dr. Hilary Dugan – 2018

Iowa, lakes and rivers chloride concentrations

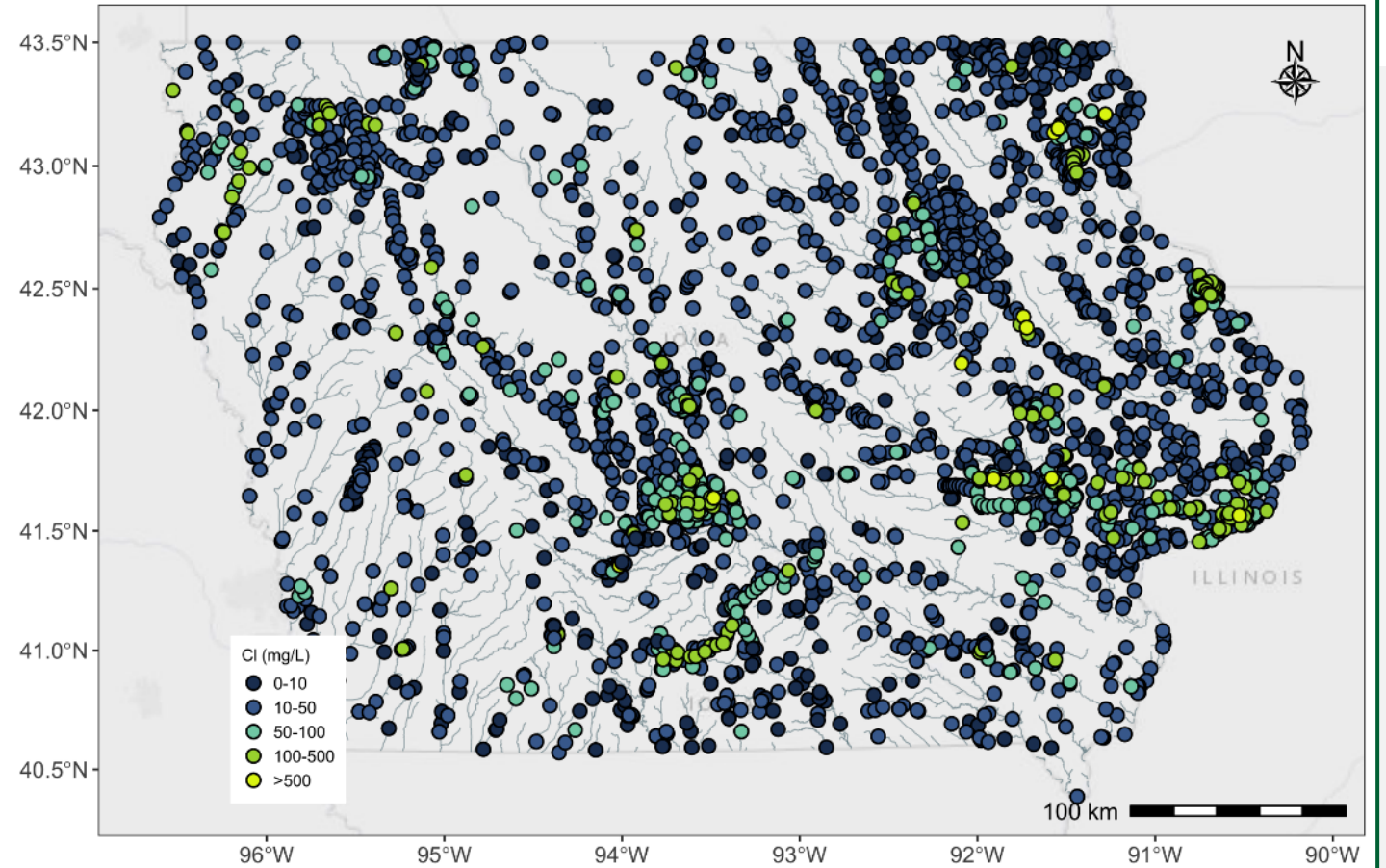
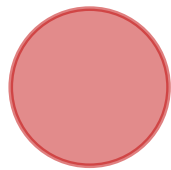
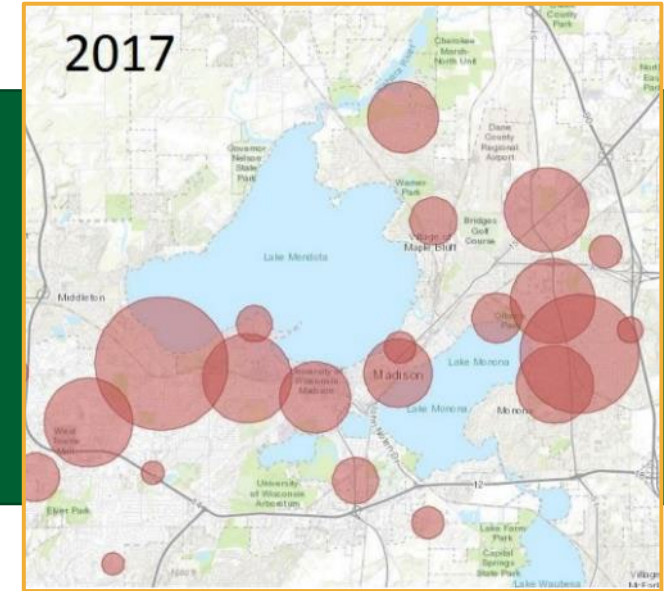
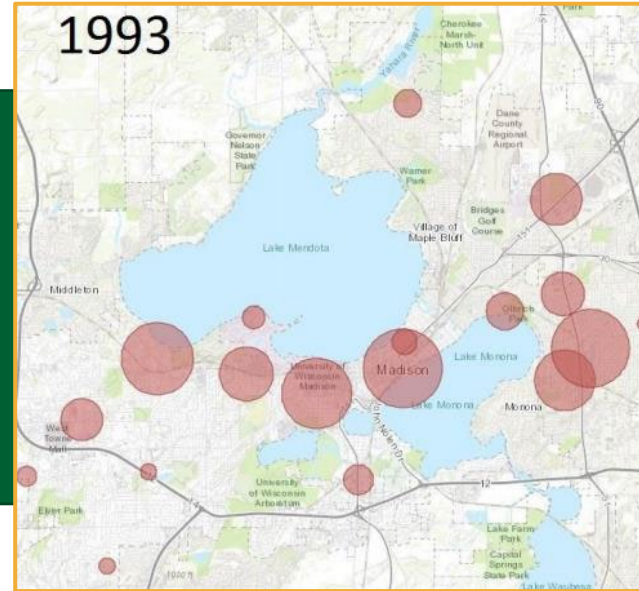
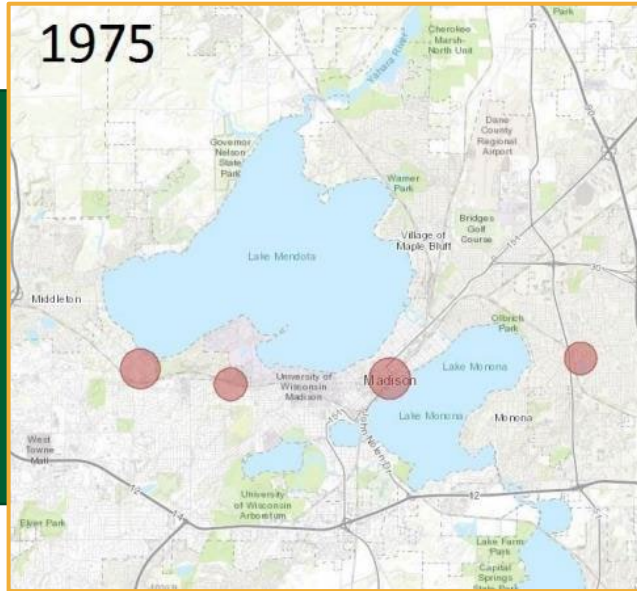


Figure by Hilary Dugan, data from US Water Quality Portal.  
Data: [www.waterqualitydata.us](http://www.waterqualitydata.us)





# Drinking Water in Madison



The larger the dot, the more chloride in wells





# Infrastructure Damage Estimate

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1 ton of salt → \$1,700 - \$17,000  
(2023 costs)



# Sterilizes Soils & Damages Vegetation

Soil stripped of several macronutrient or micronutrient cations required for plant growth



Vegetation Survival



Vegetation Establishment



Erosion Control Problems



# Opportunity to Redirect Spending

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~\$100,000,000 annually for  
road salt purchased on  
State of MN bid





## Minnesota Statewide Chloride Management Plan

**m** MINNESOTA POLLUTION CONTROL AGENCY



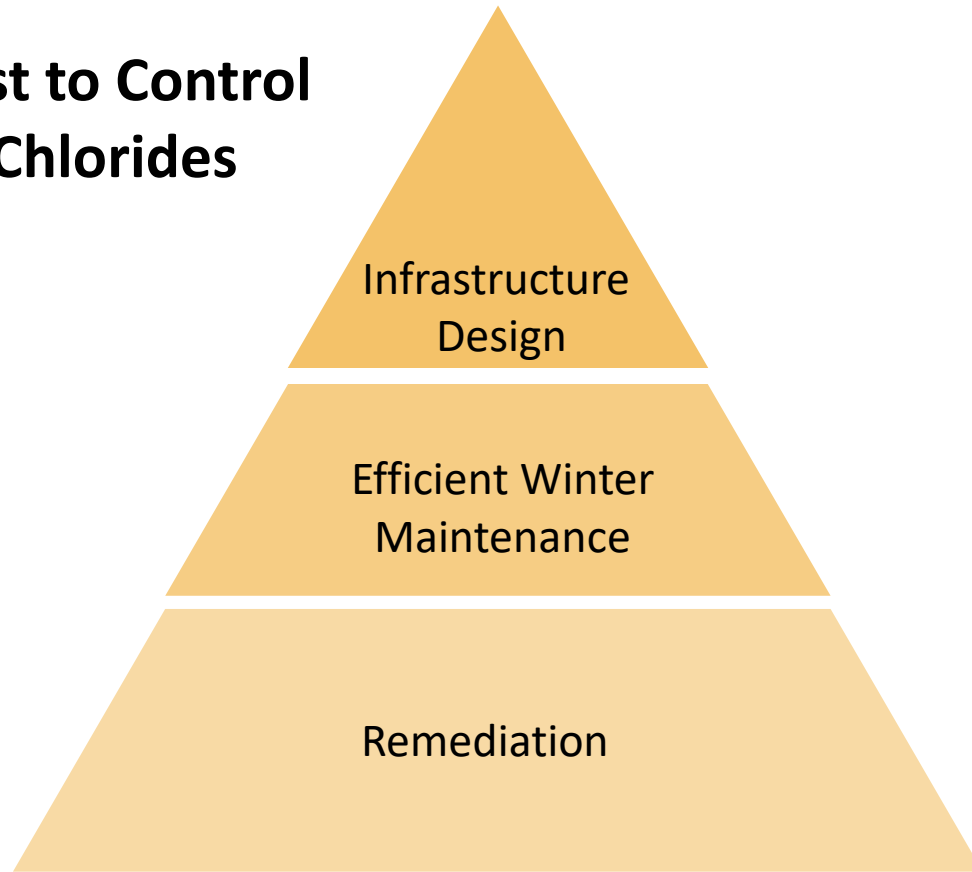
# 2021

First state in US to have state-wide chloride management plan





## Cost to Control Chlorides



# Controlling Chlorides

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**Time to** change the way we design our salted infrastructure!





# Launching Low Salt Design

**Low Salt Design** is the first major component launched in a series of Low Salt Solutions



**Low Salt Solutions**

# Design Considerations



**Use the Sun**



**Plow Access**



**Vegetation**



**Salt Storage**



**Outsmart the  
Wind**



**Pavement  
Considerations**



**Snow Storage**



**Drainage**





# Use the Sun



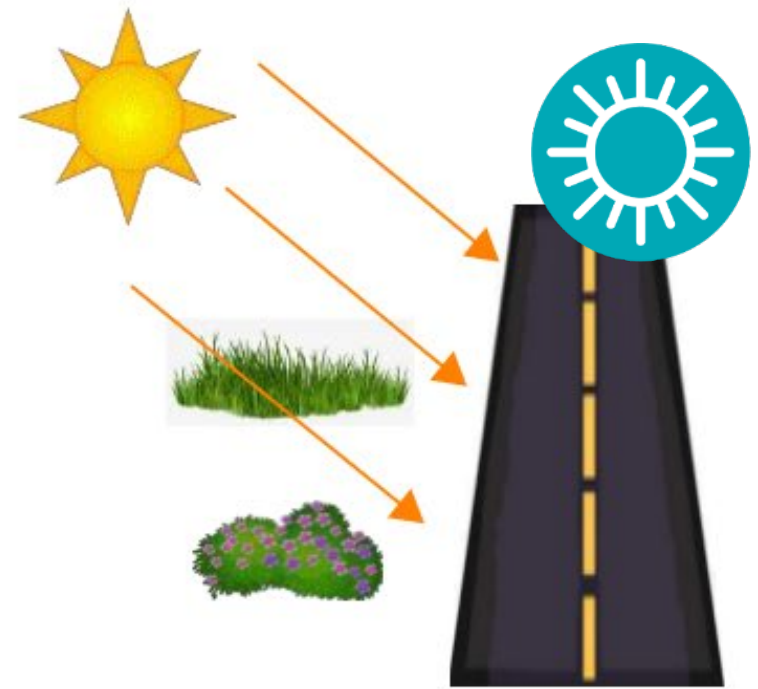
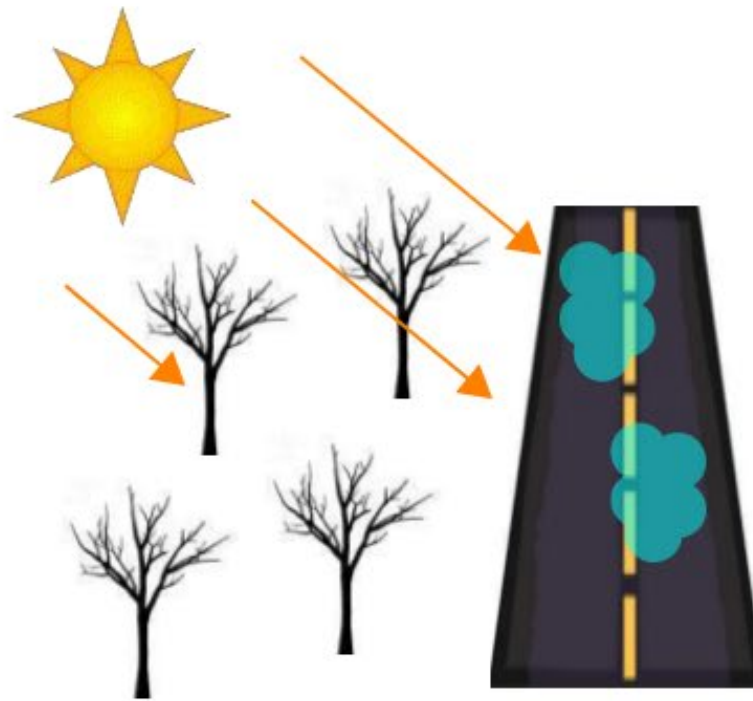
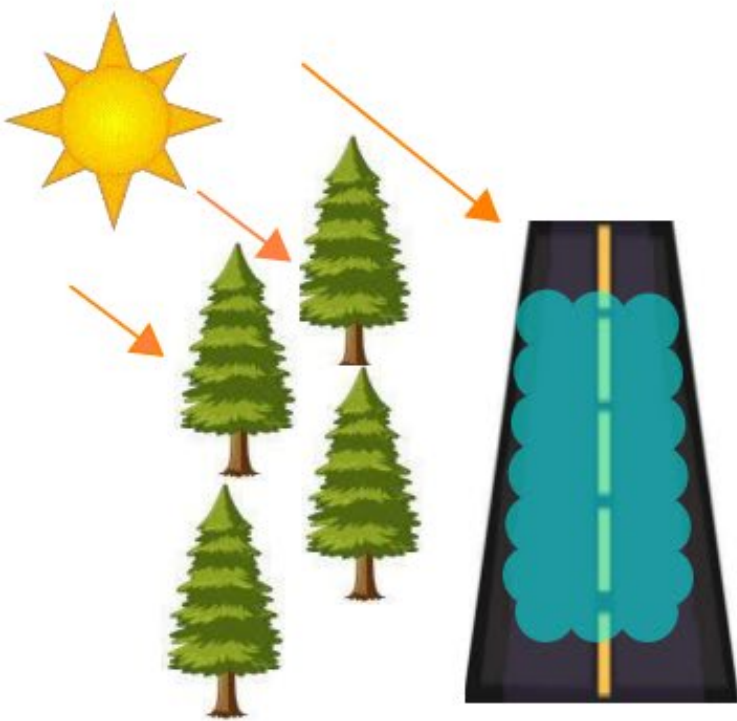
Move low spot to the sun



**HIGH SALT**



**LOW SALT**



# Use the Sun

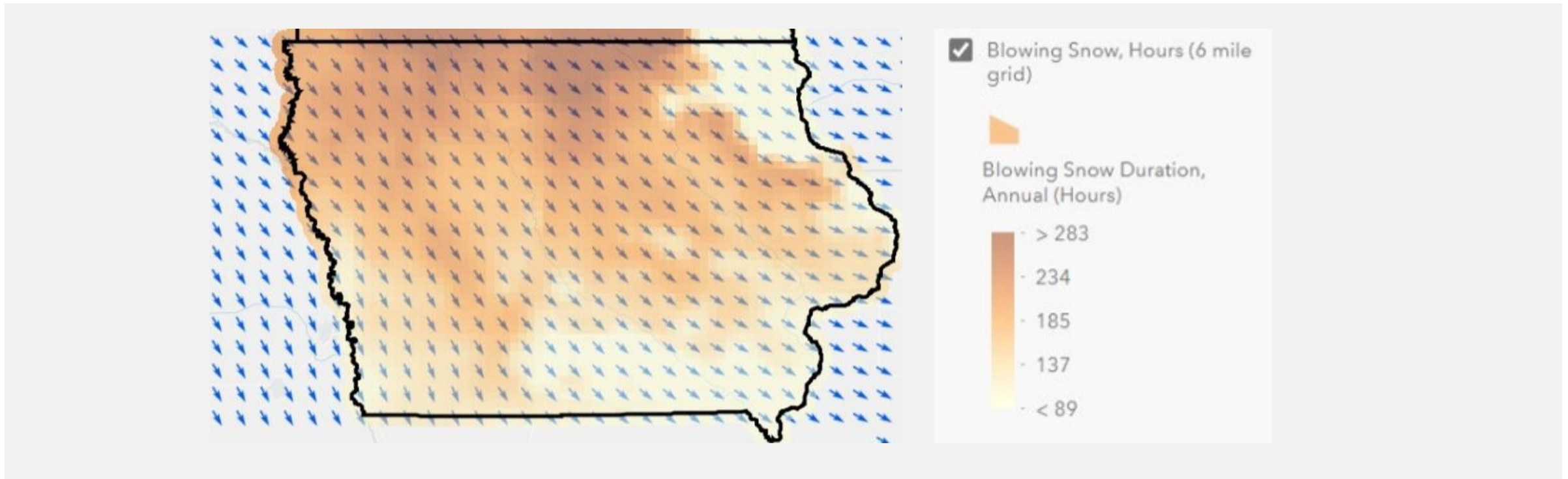
Critical stop areas

Turning areas

# Pay Attention to Winter Winds



How big of a role might it play on your project?



Data: Direction from data analysis, duration from ClearRoads Winter Severity Study published in 2012, 5-year average





# Outsmart the Wind

Put winter wind direction in your  
CAD design platform

Make it visible to your designers



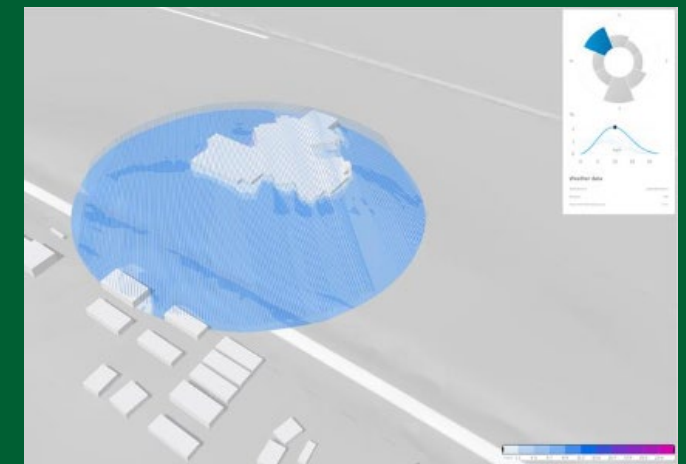
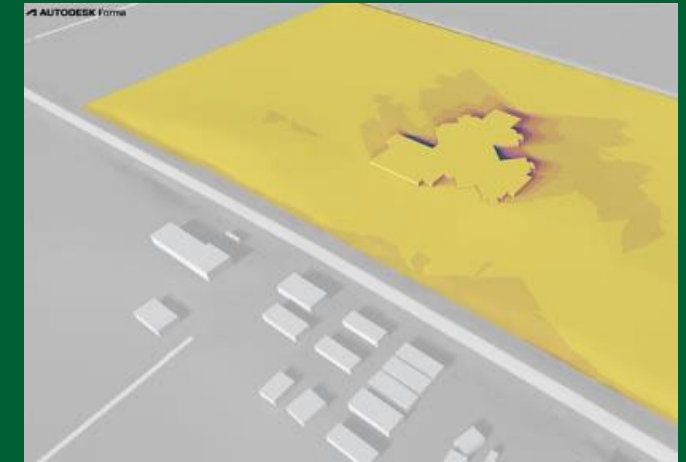
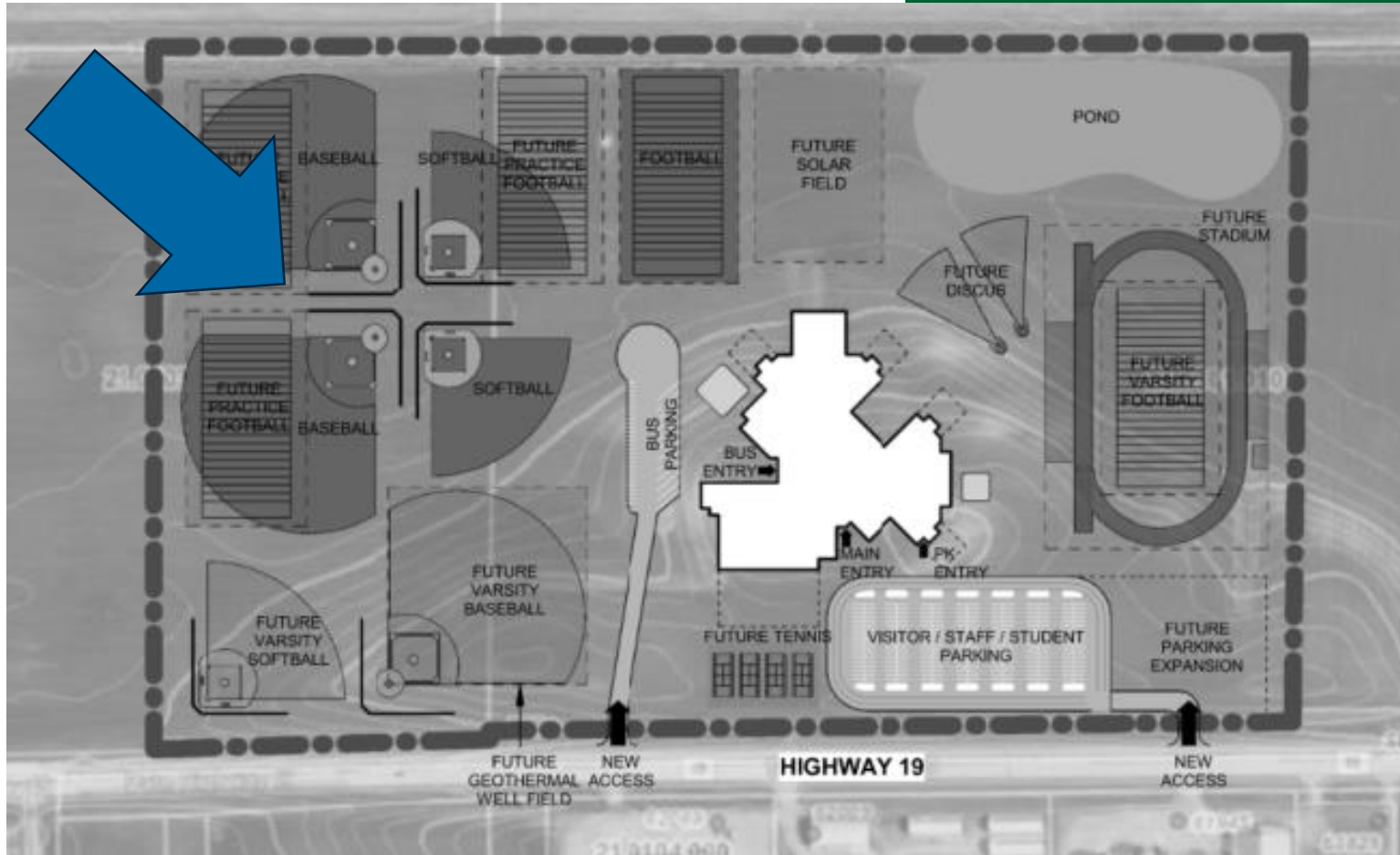


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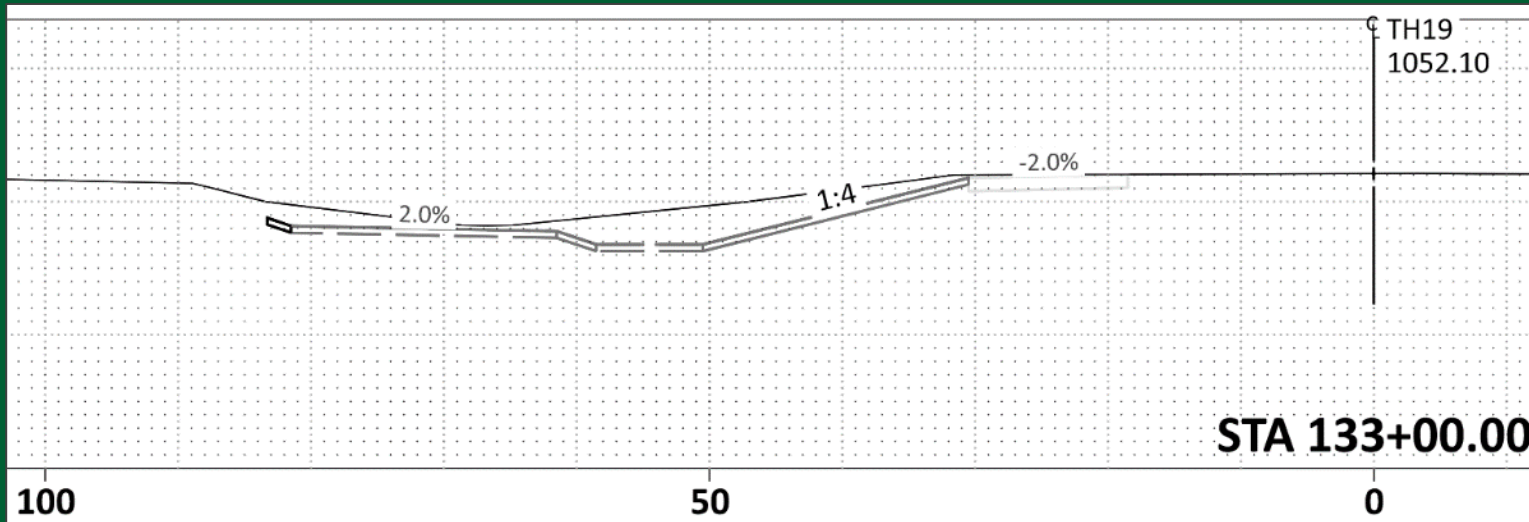


# Original Design





# Blowing Snow Calculations



*Cross section with a modified ditch*

## Minnesota Drift-Free Roads Design Tool

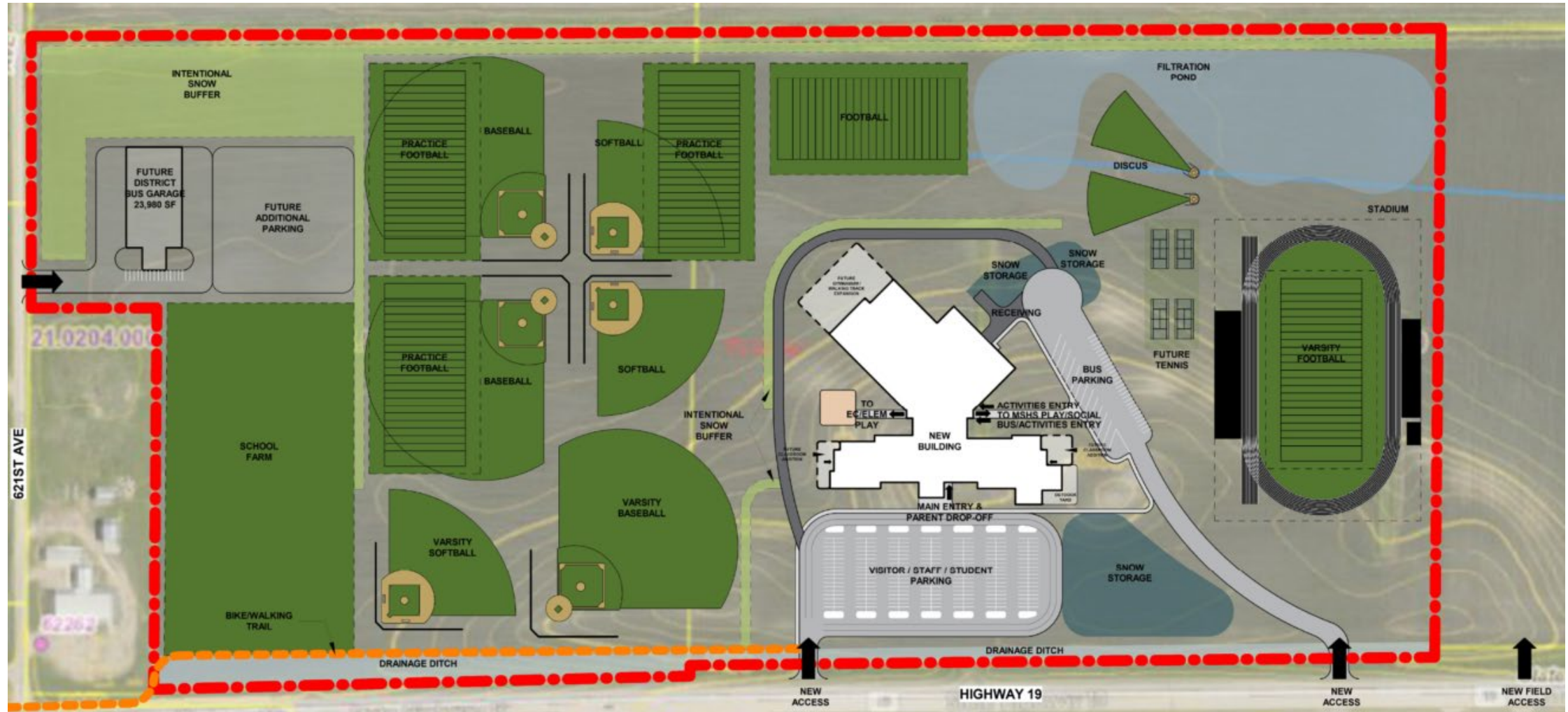
[Introduction](#) [Snowfall Data](#) [Site Conditions](#) [Fence Design](#) [Summary](#)

### UNIVERSITY OF MINNESOTA

Results from the University of Minnesota Drift-Free Roads Design Module  
For more information, see <https://snowcontroltools.umn.edu/design-tool>

Location	
Latitude	44.537
Longitude	-94.51
Snowfall Data	
Snowfall over Snow Accumulation Season	2.62
Snow Water Equivalent Ratio	0.097
Relocation Coefficient	0.38
Site Conditions	
Direction of greatest snow transport	310
Fetch Distance	10000
Mean seasonal snow transport	12.83 tons / foot
Fence Design	
Porosity	0.1
Fence Height	9.4 feet
Attack Angle	40
Fence Setback	102.29 feet
Fence Extension	Your fence must extend 577.7 ft from the acute angle side of the problem area and 37.2 ft from the obtuse angle side to prevent drifting.
Project Details	
Designed by	Justin Schmidt
Project Number	0V1130688
This report was run at	4:31:58 PM - 7/17/2023

# Updated Design





## Low Salt Design Vision

- Safer winter surfaces, less salt needed
- Reduce damage to infrastructure and chloride loading to water
- Less damage to soils, vegetation, and wildlife
- MPCA compliance & other chloride management plans





We believe winter has been  
given a backseat in design  
**We can do better!**





# Thank You! Questions?



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